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Appendix B

## Toward the Conquest of Pain

Allan P. Reed, guest editor

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# The Difference between Acute and Chronic Pain

KATHERINE P. GRICHNIK, M.D., AND F. MICHAEL FERRANTE, M.D.

PAIN has affected humankind since antiquity (1-3). Experiencing pain has always been a reality, and seeking relief from pain has probably always been a natural response (4). Pain, one of the most complex human experiences, involves physiologic, psychologic, and emotional responses (5). Pain has been divided into acute and chronic phases, originally based on temporal relationships.

Bonica (6) has defined acute pain as "a constellation of unpleasant sensory, perceptual, emotional and mental experiences with associated autonomic, psychological and behavioral responses, provoked by injury, potential injury, or acute disease." The International Association for the Study of Pain defines chronic pain as that pain which persists beyond the expected normal time of healing (7). In practice, this may be less than one month or more than six months. Three months is taken as a convenient point of division. As discussed in this article, the differences between acute and chronic pain are multiple and not just temporal.

Teleologically, acute pain has a definite purpose: It is a response to acute disease or injury and acts as a warning signal. In some situations, acute pain initiates withdrawal and protective reflexes. Chronic pain serves no apparent useful purpose and does not necessarily result from disease or injury.

This brief article reviews the scope of, differences between, and therapeutic modalities for acute and chronic pain.

## Scope

**Acute Pain.** Acute pain is one of the most frequent reasons people seek help from medical practitioners (8). Approximately 64 million people a year suffer injuries, 49 million people a year are afflicted with acute disease, and 23 million people a year undergo operations (8). Of these patients, most are undertreated or suffer from incomplete relief of their pain.

With the implementation of improved forms of pain control in the past decade, much interest has been generated in the management of acute pain. Treatment of acute pain is critical to the total care of the patient. Provision of adequate analgesia allows the patient to feel better by diminishing discomfort, and to function better by interrupting deleterious reflexes. Examples of such reflexes include splinting; bowel and bladder hypomotility; uterine vasoconstriction; myocardial insufficiency; and shock. The alleviation of pain can lead to earlier mobility and ambulation; decreased postoperative complications; increased fetal viability; and decreased mortality. Furthermore, appropriate treatment of acute pain decreases the likelihood of progression to a chronic pain state.

**Chronic Pain.** Chronic pain, a devastating problem, is one of the leading causes of disability in the United States. Bonica estimates that 25%-30% of the populations of industrialized nations are afflicted with chronic pain. One-half to two-thirds are totally disabled for some period of time. Some of these patients are permanently disabled (8).

The consequences of chronic pain include lost work days, excessive hospitalization, unnecessary operations, and overmedication. Although there are no good studies on the economics of chronic pain, it is estimated that chronic pain syndromes cost the American people about \$65 billion a year

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(8). Further, the social sequelae of chronic pain are equally disruptive, leading to estrangement from families; loss of jobs; dependency on relatives and friends; and suicide (8).

Cancer pain is a special subset of chronic pain. Approximately 3.5 million people in the United States have cancer (4). Traditionally, people with cancer have been undermedicated because of a lack of appreciation of the severity of their pain; unfounded fears of addiction; and overregulation of narcotics (4). Addiction is rarely the result of treating pain, in those with a nonaddicted premorbid personality (9).

### Physiology

Pain perception is a complex experience influenced by emotional, arousal, and thought processes (5). Our knowledge of the physiology of pain as well as of the differences between acute and chronic pain is incomplete, but under intense investigation. (See ruled box for terminology.)

**Acute Pain.** Acute pain is thought to arise from a specific tissue injury or illness. In brief, a mechanical, electrical, or chemical stimulus is detected by nociceptors, which send a neural impulse to the dorsal root ganglion via A delta and C fibers. These afferent fibers enter the dorsal horn of the spinal cord and synapse in distinct laminae of Rexed (I, II, III, V) (5). The spinothalamic system transmits nociceptive signals to more rostral areas, including the thalamus, cortex, reticular activating system, and limbic system. Specific chemical modulators of pain, not reviewed here, include endorphins, enkephalins, and serotonin.

Acute pain elicits reflexes, including skeletal muscle contraction and autonomic (especially sympathetic) nervous system activation (8-11). Tachycardia, increased cardiac output, hypertension, decreased gastric motility, vasoconstriction, increased ventilation, diaphoresis, and mydriasis are characteristically associated with perception of acute pain. These reflexes facilitate escape from the cause of the injury or coping with the injury that has occurred. However, left untreated, these responses become maladaptive and can perpetuate or exacerbate the injury or illness (6, 8).

**Chronic Pain.** Chronic pain is a more complex problem; its physiology is poorly defined. Consequently, one must rely on hypotheses and theories to understand it. Bonica has proposed that chronic pain be divided into syndromes based on peripheral mechanisms, peripheral-central mechanisms, central mechanisms, and psychological mechanisms (8).

Peripheral mechanisms result from persistent noxious stimulation of nociceptors. Sensitization of nociceptors may occur via the release of damaging vasoactive substances from cell degeneration. Pain emanating from skeletal muscle, peptic ulcers, pancreatitis, and arthritis is largely the result of peripheral mechanisms.

Peripheral-central mechanisms involve abnormal function of both the peripheral and central portions of the somatosensory system. Pain is associated with partial or complete lesions of the peripheral nervous system, resulting in loss of descending inhibitory influences and spontaneous firing of regenerated nerve fibers. Examples include causalgia, phantom limb pain, and postherpetic neuralgia.

Central mechanisms are invoked for such conditions as thalamic lesions, tabes dorsalis, and central nervous system diseases. The actual mechanisms are unknown, but may involve loss of descending inhibitory influences.

Psychological mechanisms are divided into four groups: psychosomatic illness, in which emotional stress leads to physiologic reactions; psychogenic causes, in which pain is an associated reaction to anxiety; operant mechanisms, in which the expression of pain produces secondary gain; and psychiatric pain, associated with such illnesses as schizophrenia.

In general, chronic pain does not elicit sympathetic nervous system responses. As painful conditions become prolonged and continuous, autonomic nervous system activity decreases. Persons with chronic pain are also thought to have a depletion of serotonin and endorphins, leading to decreased pain tolerance (6, 8). Often, patients with chronic pain develop vegetative signs, such as loss of appetite, sleep disturbances, loss of libido, and constipation.

### Psychology

The most striking differences between acute and chronic pain are the individual reactions to each one.

**Acute Pain.** The predominant psychological response to acute pain is anxiety (12). This response is further modified by the individual's degree of preparedness as well as the perceived etiology and anticipated duration of the pain. Acute pain usually has a definable cause and can rarely be attributed solely to psychological factors. Further, the emotions provoked by acute pain serve to mobilize a person to react (move, withdraw) to the pain.

**Chronic Pain.** Chronic pain elicits a very different set of psychological responses. One important difference is that the individual cannot give meaning to the pain (12). The pain serves no purpose as a warning signal that would lead to avoidance or treatment. Characteristic responses include despair, fear, and hopelessness. This in turn predisposes to overt depression, hypochondriasis, and somatic focusing. Further, cognitive behavior changes can occur secondary to excess medication.

Chronic pain patients also become enmeshed in the medical community as they go from doctor to doctor and test to test in an effort to have the pain diagnosed and treated. For many patients, the pain becomes the central focus of their lives. The patient is reduced to an existence encompassing only home, pharmacy, and doctors' offices (6). As patients withdraw from society, they lose their jobs, alienate family and friends, and become isolated. Seventy percent of chronic pain patients divorce, and 20% contemplate or commit suicide (13).

### Therapeutics

The therapeutic approaches to acute and chronic pain also differ markedly. In acute pain, therapy is directed at interrupting the nociceptive signal. One therapeutic measure is peripheral neural blockade. Spinal and epidural anesthesia/analgesia interrupts propagation of neural impulses at the level of the spinal cord. These modalities are useful not only for surgical pain control, but also for medical illness.

Traditionally, parenteral narcotics have been the mainstay of acute pain management, but the amount and dosing intervals have been inadequate for complete pain relief (14, 15). Fortunately, this situation is slowly changing as the benefits of adequate analgesia are recognized. Alternative methods of delivery, such as patient-controlled analgesia, are frequently employed.

**Chronic Pain.** Management of chronic pain is more complex. The treatment of choice is prevention. Attempts at preventing chronic pain require early and adequate therapy for acute pain. Further, the treatment of chronic pain must be multidisciplinary, involving specialists in anesthesiology, physical therapy, social services, and surgery.

Specific medical treatment of chronic pain requires an exhaustive search for organic illness that may have initiated or maintained chronic pain. Whether found or not and whether treatable

### Pain Terms

**Allodynia** pain due to nonnoxious stimulus to normal skin

**Analgesia** absence of pain on noxious stimulation; relief of pain without loss of consciousness

**Causalgia** a syndrome of sustained burning pain, allodynia, and hyperpathia after a traumatic nerve lesion, combined with vasomotor and sudomotor dysfunction with trophic changes

**Central pain** pain associated with a lesion of the central nervous system

**Dysesthesia** a spontaneous or evoked unpleasant, abnormal sensation

**Hyperalgesia** increased sensitivity to noxious stimulation

**Hyperpathia** increased reaction to stimulus

**Hypalgesia** decreased sensitivity to noxious stimulation

**Neuralgia** pain in the distribution of a nerve or nerves

**Neuritis** inflammation of a nerve or nerves

**Neuropathy** a disturbance of function or pathologic change in a nerve

**Nociceptor** a receptor preferentially sensitive to a noxious or potentially noxious stimulus

**Pain** an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage

**Pain threshold** the least-intense stimulus at which a subject perceives pain

**Pain tolerance level** the greatest stimulus intensity causing pain that a subject is prepared to tolerate

*Adapted from Merskey H. Pain terms . . . recommended by the IASP Subcommittee on Taxonomy. Pain 1979; 6:249-252.*

or not, further therapy is often reduced to neural blockade, nonnarcotic medications, electrical modalities, and narcotics (16-18).

Frequently used blockade techniques include epidural steroid injections for low back pain and efferent sympathetic interruption for reflex sympathetic dystrophies. Nonnarcotic medications provide adjunctive therapy for specific kinds of pain. Tricyclic antidepressants can be used for cancer pain; anticonvulsants for neuropathic pain; and nonsteroidal anti-inflammatories for metastatic bone pain. Electrical modalities include transcutaneous nerve stimulation and dorsal column stimulation.

The judicious use of narcotics has a role in chronic pain management, especially for the cancer patient. Narcotics can be delivered to the pa-

tient through several routes, including the oral, subcutaneous, epidural, and subarachnoid. Cancer patients often require extraordinary amounts of narcotics. Narcotics should not be withheld for fear of addiction or respiratory depression.

### Summary

Acute and chronic pain are different clinical entities. Acute pain is provoked by a specific disease or injury, serves a useful biologic purpose, is associated with skeletal muscle spasm and sympathetic nervous system activation, and is self-limited. Chronic pain, in contrast, may be considered a disease state (8). It is pain that outlasts the normal time of healing, if associated with a disease or injury. Chronic pain may arise from psychological states, serves no biologic purpose, and has no recognizable end-point. Both acute and chronic pain are an enormous problem in the United States, costing 650 million lost workdays and \$65 billion a year (8). The therapy of acute pain is aimed at treating the underlying cause and interrupting the nociceptive signals. The therapy of chronic pain must rely on a multidisciplinary approach and should involve more than one therapeutic modality.

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